The Map Results of an UAV-Based Remote Sensing Platform in the Yucatán

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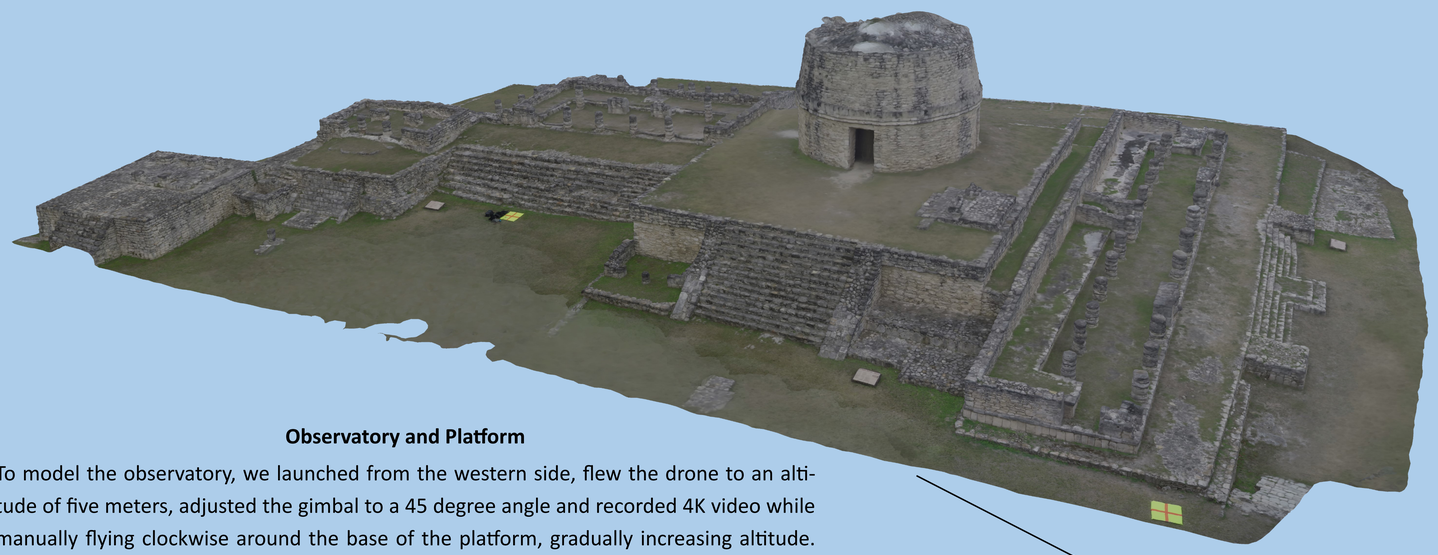
Introduction

These are the results of using unmanned aerial vehicles (UAVs or drones) and sensors to photograph, map, and create 3D models of archaeological ruins and excavations. The city of Mayapán and its hinterland, is located 40 km southeast of modern Mérida, Mexico. It was the largest Maya political capital of the Postclassic Period and was occupied A.D. 1100–1446. It's size exceeded all other lowland cities in Belize, Guatemala, and Mexico by an order of magnitude. Within Mayapán's defensive wall, it was one of the most densely nucleated of all Maya cities. It was a key center of political, religious, and economic activity.

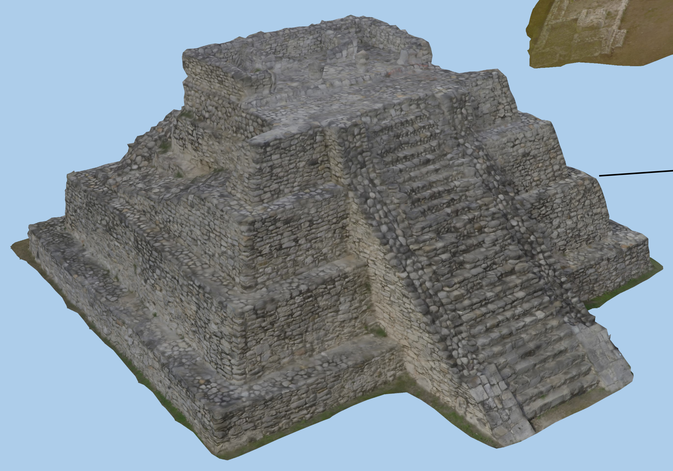


Observatory and Platform

To model the observatory, we launched from the western side, flew the drone to an altitude of five meters, adjusted the gimbal to a 45 degree angle and recorded 4K video while manually flying clockwise around the base of the platform, gradually increasing altitude. The orientation of the camera gimbal was adjusted to maximize image overlap. We flew the drone over top of the observatory and platform at approximately 20 meters altitude, using North-South survey lines to ensure sufficient overlap and quality pictures of an overhead view.

Northwestern Temple

Taking off on the southern side of the temple, we began our concentric flight plan at five meters, following the base clockwise. We increased altitude gradually and readjusted camera to account for image overlap. We maneuvered the drone as needed to avoid over-hanging tree branches on near the edge of the clearing. We flew the drone over the top of the temple with the camera angle pointed straight down to complete the flight. West-east survey lines were flown to ensure overlap of the images.



Southeastern Temple

launching from the temple's NW corner, we began flying concentric rings at five meters altitude following the base of the temple clockwise. The drone was raised with each rotation and the attached camera was adjusted for the best angle. On completion, the drone was raised to 20 meters to allow a complete view of the structure.

Conclusion

The creation of new maps and 3D models of ruins contributes to the modernization and improvement of archaeologic studies. UAV-based photogrammetry makes possible creation of maps and 3D models with centimeter-level accuracy enhancing the study of ancient architectural structure and construction. Each model can be integrated into a larger site or regional-level model assisting in site Using the 3D reconstruction allows for the reliable study of movement patterns throughout the city, urban acoustics studies, and archeoastronomy with greater accuracy and at faster rates than previously possible.

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